

Nutrition – Study Guide

Water

- 60 % of an adult's body weight (higher percentage in children)
- Water makes up ~75% of lean tissue and 25% of fat
- Less percentage of water in females, obese individuals, and elderly

Functions:

- i. Carries nutrients and waste products
- ii. Participates in metabolic reactions
- iii. Acts as lubricant and cushion for joints, eyes, spinal cord, and the amniotic sac in pregnancy
- iv. Regulation of body temperature
- v. Maintains blood volume

Water balance:

Balance between water intake and output

- The body's cells do a very good job of maintaining normal conditions

Intracellular fluid

- Fluid within the cells
- High in potassium and phosphate
- 2/3 of the body's water

Extracellular fluid (interstitial fluid and plasma)

- Fluid outside the cells
- Interstitial fluid is high in sodium and chloride
- 1/3 of the body's water

Inadequate water intake

- Blood becomes concentrated
- Mouth becomes dry
- Hypothalamus initiates drinking behavior
- Urine dark yellow

Excessive water intake

- Stomach expands
- Receptors send signals to stop drinking fluids
- May cause water intoxication (rare – dilutes concentration of blood)

Water loss:

- Insensible (4.5 cups per day)
 - Breathing
 - Skin (non-sweat)
- Sensible
 - Urine (6-7 cups per day)
 - Feces (1/2 cup)
 - Sweat (1/2 – 9 cups in athletes)

Water sources: fluids/beverages. Almost all foods contain water. End product of metabolic reactions in the body

Water recommendations:

Vary depending upon diet, activity level, environmental temperature, and humidity

AI for total water (includes food):

Men: 3.7 L/day (16 cups)

Women: 2.7 L/day (12 cups)

Average intake for adults is ~ 3 L (12-13 cups)

Any beverage/fluid is good for hydration purposes (must consider weight management)

Water maintains blood volume:

Blood volume influences blood pressure

Kidneys are also very important in regulation of blood volume and blood pressure – reabsorb needed substances and excrete wastes

Fluid and electrolyte balance:

Electrolytes – salts that dissolve in water and break apart into charge particles called ions

- Cations are positively charged
- Anions are negatively charged
- Ex. NaCl separates into Na⁺ and Cl⁻

Anion and cation concentrations are always balanced

Electrolytes attract water

- When electrolytes move across the cell membrane, water follows

Vitamins – organic, essential nutrients required in small amounts by the body for health.

Vitamins regulate body processes that support growth and maintain life

Vita = life amine = containing Nitrogen

Water-soluble vitamins: found a lot in blood and urine, kidneys filter

- B Vitamins
 - Thiamin, Riboflavin, Niacin, Biotin, Pantothenic acid, Vitamin B₆, Folate, Vitamin B₁₂
- Vitamin C

Fat-soluble vitamins:

- Vitamin A
- Vitamin D
- Vitamin E
- Vitamin K

B vitamins serve as coenzymes

- Attaches to enzyme and allows it to continue with process/reaction
- Energy metabolism process

Minerals – major minerals are need in large amounts, trace minerals in small amounts

- Inorganic elements: contain no carbon and cannot be charged
- Cannot be destroyed by heat, air, acid, or mixing
- Minerals can be lost when they leach into water

- Variable Bioavailability: binders in food can combine chemically with minerals and prevent their absorption
 - Phytats are found in legumes and grains
 - Oxalates are found in spinach and rhubarb

Major minerals:

Calcium Phosphorus Chloride Magnesium
 Potassium Sulfur Sodium

Dietary Folate Equivalents – the amount of folate available to the body from naturally occurring sources, fortified foods, and supplements, accounting for differences in the bioavailability from each sources

$$\text{DFE} = \mu\text{g food folate} + (1.7 \times \mu\text{g synthetic folate})$$

Example:

Supplement	100 μg	
Fortified cornflakes	100 μg	
Fortified bread	40 μg	
<u>Fortified pasta</u>	<u>60 μg</u>	
	300 μg	
		$\times 1.7 = 510 \mu\text{g DFE}$
		<u>+ 90 μg</u>
		600 $\mu\text{g DFE overall}$

Free Radicals and Antioxidants

Free Radical:

- Created by metabolic reactions in the body which produces unstable molecule (unpaired electron)
- Created by oxygen reacting with body compounds
- Damage fatty acids, DNA/RNA, proteins
- Other causes – UV rays, air pollution, tobacco

Antioxidant: protects membranes and gets free radicals away

Main minerals against oxidants – selenium, manganese, and zinc

Antioxidant Vitamins:

- Vitamin E – defends body lipids
- Beta Carotene – defends lipid membrane
- Vitamin C – protects other tissues

Defending against free radicals:

- Selenium, manganese, and zinc and the Antioxidant vitamins

To receive more antioxidants in our diets, choose more fruits and vegetables rich in beta-carotene, vitamin C, and minerals. Choose fats high in vitamin E.